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Filed:	01/16/2004	Examiner:	William L. Boddie
Applicants:	Young-Ki Kim, et al.	Art Unit:	2629
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PRE-APPEAL-BRIEF REQUEST FOR REVIEW

Sir:

The Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The claims that are at issue are listed in the Appendix hereto, beginning at page 7 hereof.

The review is requested for the reasons stated on the attached sheets, beginning at page 2 hereof.

REASONS FOR REQUEST

The Applicant respectfully requests a formal review by a panel of senior Examiners prior to the filing of an appeal brief of the final rejection of claims 1, 3-6, 9, 10 and 13 made in the final Office action of 05/09/2007 in the above-identified application for the reasons that follow. A listing of the claims and their status is attached hereto as an Appendix.

FIG. 3

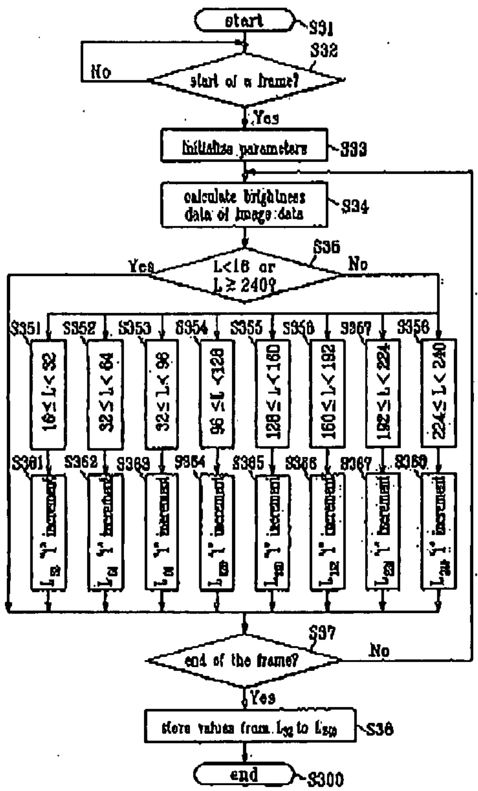
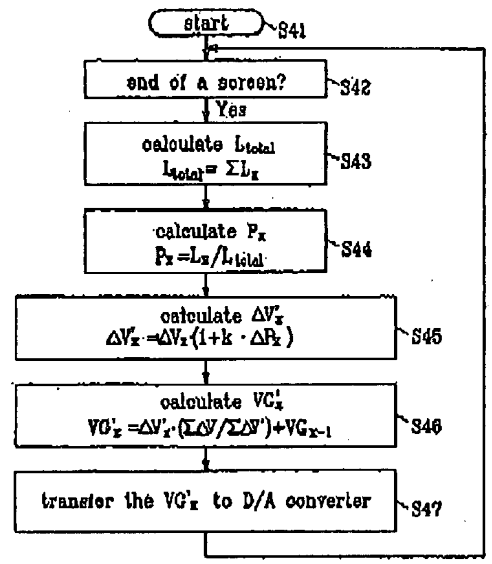


FIG. 4



The present invention is directed to a signal controller for a liquid crystal display (LCD) that includes a gray voltage generator that, on a frame-by-frame basis, first calculates the distribution probabilities of the luminance of the image data in gray-scale level "sections" for each frame of data (Fig. 3, upper left, pars. [0066] – [0068]), then uses the gray distribution probabilities in a computational algorithm (Fig. 4, upper right, pars. [0069]-[0079]) to modify a standard digital gray voltage curve into a "target" digital gray voltage curve in which the gradient of the curve is increased in those sections in which the gray distribution is large, and decreased in sections in which the gray distribution is small. The gray voltage generator then serially outputs the

target gray voltages to a conventional digital-to-analog (D/A) converter 810, which converts the digital target data to appropriate analog voltages, and then outputs these to the data driver 500 of the LCD for application to the LCD panel 300. (Fig. 1; par. [0080].)

Accordingly, independent claims 1 and 9 of the present application include the following distinguishing limitations:

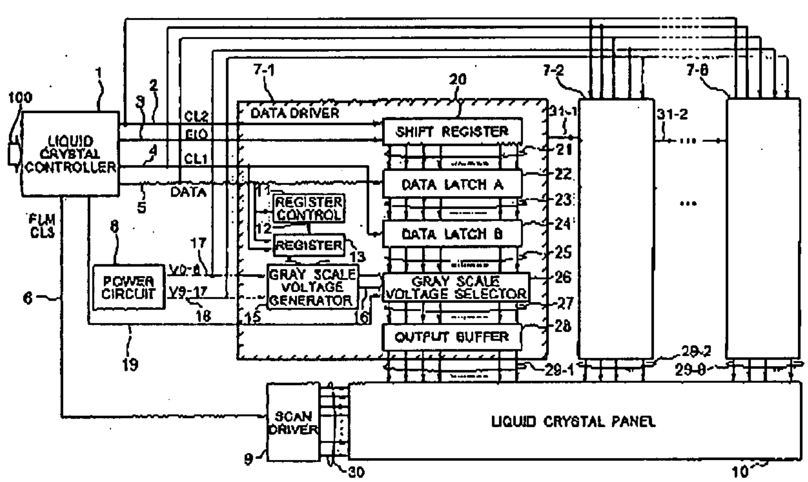
<u>Claim 1:</u> "... a signal controller supplying image data to a data driver and generating digital gray data based on a distribution of grays of the image data for one frame ...;" and, "<u>a digital/analog converter converting the digital gray data from the signal controller into analog voltages</u> ...."

<u>Claim 9:</u> " ... modifying a standard gray voltage curve based on the calculated gray distribution to generate digital gray data"; and, "<u>converting the digital gray data into analog voltages</u> ...." (Appendix, claims 1 and 9, emphasis added.)

In <u>section 5</u> of the final Office action of 05/09/2007, the Examiner rejected claims 1-3, 5-6 and 9-10 under 35 U.S.C. 102(b) as being anticipated by Nitta et al. (US 6,801,178), stating, in pertinent part,

> "With respect to claim 1, *Nitta discloses ... a digital/analog converter (11-15 in fig. 1; col. 4, lines 36-38)* converting the digital gray data (5 in fig. 1) from the signal controller (1 in fig. 1) into analog voltages (VGO-VG255 in fig. 6) and supplying the analog voltages (16 in fig. 1) to the data driver as the gray voltages ...." (Emphasis added.)

FIG. 1 - Nitta et al.



In light of the remarks that follow, it is respectfully submitted that the Examiner that the above rejection should be overruled by the Pane, in that Nitta et al. ("Nitta") do not teach or suggest a D/A converter or an equivalent thereof.

The Nitta reference teaches a controller 1 for an LCD that controls a plurality of "data drivers 7-1 – 7-8," each of which includes a "gray scale voltage generating circuit 15" (Nitta, Fig. 1 above). According to Nitta, "selectors 207 and 208" of the gray scale voltage generating circuit 15 include a plurality of switches, the states of which are respectively defined by signals from a "register 13." Thus, each of the selectors 207 and 208 selects from among a plurality of analog voltages VG8, VG16, VG24, VG56, VG200, VG208, VG216, VG248, ... in accordance with a signal from the register 13. That is, as described in Nitta and shown in FIG. 7 thereof, when the switch of the selector 207 that is connected to a line B1 is turned on, a voltage Vo is outputted as the voltage VG8, and as shown and described in FIG. 8 of Nitta, when the switch of the selector 208 that is connected to a line W6 is turned on, a voltage V8 is outputted as the voltage VG200. As a result, the selectors 207 and 208 operate to select among analog reference voltages V0 and V8. *Id.*, col. 7, lines 16-33.

As illustrated in FIG. 6 of Nitta, the gray scale voltage generating circuit 15 divides each of the respective voltages between eighteen plus and minus reference voltages (V0 – V8) and (V9 – V17) generated from a "power circuit 8" that are defined by the selectors 207 and 208 using resistors 205 to generate the plurality of gray scale voltages VG0 – VG255. Thus, although the Examiner contends that the gray scale voltage generating circuit 15, including the selectors 207 and 208, functions as a D/A converter, the gray scale voltage generating circuit 15 in fact functions as a voltage divider. It should be further noted that, at this point, the divided voltages are all analog voltages, *i.e.*, analog signals in and analog signals out.

Additionally, as illustrated in FIG. 1 of Nitta above and described at col. 4, lines 50-54 thereof, by operating the gray scale voltage selector 26, one of the analog gray scale voltages generated by the gray scale voltage generating circuit 15 is selected as a voltage corresponding to the display data, "DATA," which is stored in a "data latch B" 24 as a digital signal, and the selected voltage is applied to the liquid crystal panel 10 through an output buffer 28. Accordingly, the purported "D/A converter" of Nitta is the gray scale voltage selector 26, not the gray scale voltage generating circuit 15.

Further, the register 13 does not store the liquid crystal display data, "DATA," but instead, "the correspondence relationships between the liquid crystal display data, DATA, and the liquid crystal gray scale voltages." (*Id.*, col. 4, lines 36-38, emphasis added.)

In light of the foregoing, it may seen that, although the Examiner contends that the gray scale voltage generating circuit 15 is a D/A converter, the gray scale voltage generating circuit 15 of Nitta is actually a voltage divider that includes "selectors 207 and 208" to generate the plurality of analog voltages that are used to drive the panel. That is, the gray scale voltage generating circuit 15 of Nitta is not the same as, nor is it the functional equivalent of, the "digital/analog converter" of the present invention.

In addition, from the limitation of claim 1 of the present invention, "a signal controller supplying image data to a data driver and generating a digital gray data based on a distribution of grays of the image data for one frame," it may be seen that the signal generated by the signal controller is inherently a digital type of signal, whereas, the signal generated by the gray scale voltage generating circuit 15 of Nitta is inherently an analog type of signal. Thus, the present invention must utilize a true D/A converter to convert the digital gray data into an analog gray data for transmission to the data driver, whereas, Nitta does not require a D/A converter, since the gray scale voltage generating circuit 15 itself generates the analog signals and transmits them directly into the gray scale voltage selector 26, without any digital-to-analog signal conversion taking place. Thus, as stated at col. 4, lines 50-54 of Nitta, the gray scale voltage selector 26 of Nitta in fact corresponds to the data driver 500 of the present invention.

In reply to Applicant's assertions above that Nitta does not teach or suggest a D/A converter, the Examiner stated,

> "[T]he Applicants again argue that Nitta does not disclose a D/A converter in elements 11-15 of figure 1. The Applicants contend that the gray scale voltage generating circuit of Nitta functions as a voltage divider alone and not as a D/A converter. The Examiner respectfully disagrees. Nitta's gray scale voltage generator does in part function as a voltage divider. There, however, is more functionality imparted in elements 11-15 than mere simple voltage division. Digital data signals are supplied to the elements (DATA and CL1 in fig. 1), and based on these inputs, a specific set of analog gray scale voltages are selected to be output. This would seem to the Examiner to satisfy the current requirements of a digital/analog converter. ***In short, digital data is accepted in, and in return, analog voltages specific to the digital data is output. As such, the rejections are seen as sufficient and are maintained.***" (Advisory Action dated 07/23/2007, section 11, emphasis added.)

Thus, the Examiner argues simply that, in Nitta, "digital data [goes] in and ... analog voltages specific to the digital data is output," and accordingly, there must be a D/A converter somewhere in Nitta. However, as discussed above and shown in FIGS. 1 and 6 of Nitta, the out-

put signals 14 from the register 13, based on "correspondence relationships" between the liquid crystal display data, DATA, and the liquid crystal gray scale voltages, function as control signals to control the operation of a selection circuit 203, while input signals of a gray scale voltage generator 15 that outputs analog voltages VG0 – VG255 that are input as analog reference voltages V0-V8 and V9-V17. Thus, Nitta does not teach or even suggest a "D/A converter," but rather, an "analog voltage selector."

In section 7 of the Final Office action, claims 4 and 13 were rejected under 35 U.S.C. 103(a) as being unpatentable over Nitta et al. above in view of Kitahara et al. (US 6,847,377). However, a review of the Kitahara '377 reference reveals that it does not supply any of the deficiencies in teaching of Nitta et al. '178 discussed above *vis-à-vis* independent claims 1 and 9, from which claims 4 and 13 depend, and accordingly, it is respectfully submitted that these claims are likewise patentably distinguishable over the combination of Nitta et al '178 and Kitahara et al '377.

In light of the foregoing distinct differences between Nitta and the present invention, it is respectfully submitted that independent claims 1 and 9, as well as the claims respectively dependent from them, are patentably distinguishable over the Nitta et al. '178 and Kitahara '377 references, and accordingly, that the above rejections of claims 1 and 3-13 should be overruled by the Panel.

WHEREFORE, the Applicant respectfully requests that the Examiner's final rejection of claim 1-20 of this application be overruled and that a timely Notice of Allowance be issued in this case.

If there are any questions regarding this request, please contact the undersigned at the number below.

Certification of Facsimile Transmission
I hereby certify that this paper is being facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

Saundra L. Carr
Saundra L. Carr

Aug. 9 , 2007
Date of Signature

Respectfully submitted,

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Encl.: Notice of Appeal.

APPENDIX - Listing of Claims:

1. (rejected) An apparatus for driving a liquid crystal display, including a plurality of pixels arranged in a matrix, the apparatus comprising:

a signal controller supplying image data to a data driver and generating digital gray data based on a distribution of grays of the image data for one frame; and,

a digital/analog converter converting the digital gray data from the signal controller into analog voltages and supplying the analog voltages to the data driver as the gray voltages,

the data driver selecting data voltages corresponding to the image data representing at least one gray from the gray voltages and applying the data voltages to the pixels.

2. (cancelled)

3. (rejected) The apparatus of claim 1, wherein each image data has a luminance data having a value, which is determined by the at least a gray represented by the image data and belonging to one of a plurality of value sections, and the gray distribution is associated with the number of the image data belong to respective value sections.

4. (rejected) The apparatus of claim 3, wherein each image data includes a set of image data portions for a predetermined number of respective colors, and the luminance data of the image data is defined as an average of the grays represented by the set of the image data portions forming the image data.

5. (rejected) The apparatus of claim 3, wherein the signal controller comprises a gray voltage generator reading out the image data for one frame, calculating the gray distribution of the image data and modifying a standard gray voltage curve to obtain the digital gray data.

6. (rejected) The apparatus of claim 5, wherein the gray voltage generator calculates the luminance data of the image data for one frame, calculates the number of the image data included in the value sections to obtain the gray distribution of the image data

7. (allowable) The apparatus of claim 6, wherein the gray voltage generator calculates a target gray voltage (VG_X') of each value section corresponding to the digital data voltage based on relations given by:

$$\Delta V_X' = \Delta V_X \cdot (1+K_X \cdot \Delta P_X) \quad \text{and,}$$
$$VG_X' = \Delta V_X' \cdot (\Sigma\Delta V/\Sigma\Delta V') + VG_{X-1},$$

where ΔV_X is a difference between a maximum gray voltage and a minimum gray voltage for the value section on the standard gray voltage curve, K_X is a weight value assigned to the section, ΔP_X is defined as P_X- $(AP)_X$, where P_X is a distribution probability for the value section and $(AP)_X$ is a distribution probability for maintaining the standard gray voltage curve, $\Sigma\Delta V$ is a sum of the differences (ΔV_X) between maximum gray voltages and minimum gray voltages for the respective value sections on the standard gray voltage curve, $\Sigma\Delta V'$ is a sum of $\Delta V_X'$, and VG_{X-1} is a maximum gray voltage of a previous value section in the standard gray voltage curve.

8. (allowable) The apparatus of claim 7, wherein the weight value (K_X) for each section is determined as the value exhibiting the best visibility for the value section.

9. (rejected) A method for driving a liquid crystal display, the method comprising:

reading out image data representing at least a gray for one frame;

calculating gray distribution of the read image data;

modifying a standard gray voltage curve based on the calculated gray distribution to generate digital gray data;

converting the digital gray data into analog voltages; and

supplying the analog voltages to a data driver as gray voltages.

10. (rejected) The method of claim 9, wherein the gray distribution calculation comprises:

calculating luminance data of the image data based on the at least a gray represented by the image data; and,

counting the number of the image data included in a plurality of sections of the luminance data.

11. (allowable) The method of claim 10, wherein the digital data voltage (VG_X') is calculated based on relations given by:

$$\Delta V_X' = \Delta V_X \cdot (1+K_X \cdot \Delta P_X) \quad \text{and,}$$

$$VG_X' = \Delta V_X' \cdot (\Sigma\Delta V/\Sigma\Delta V') + VG_{X-1},$$

where ΔV_X is a difference between a maximum gray voltage and a minimum gray voltage for the value section on the standard gray voltage curve, K_X is a weight value assigned to the section, ΔP_X is defined as P_X- $(AP)_X$, where P_X is a distribution probability for the value section and $(AP)_X$ is a distribution probability for maintaining the standard gray voltage curve, $\Sigma\Delta V$ is a sum of the differences (ΔV_X) between maximum gray voltages and minimum gray voltages for the respective value sections on the standard gray voltage curve, $\Sigma\Delta V'$ is a sum of $\Delta V_X'$, and VG_{X-1} is a maximum gray voltage of a previous value section in the standard gray voltage curve.

12. (allowable) The method of claim 11, wherein the weight value (K_X) for each section is determined as the value exhibiting the best visibility for the value section.

13. (rejected) The method of claim 10, wherein each image data includes a set of image data portions for a predetermined number of respective colors, and the luminance data of the image data is defined as an average of the grays represented by the set of the image data portions forming the image data.